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Effects of K_2CO_3 modification on development of microporous commercial activated carbon WG12 for CO_2 adsorption

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Rapidly increasing concentration of CO^2 in the atmosphere has drawn more and more attention in recent years. The adsorption has been considered as an effective technology for CO^2 capture. Activated carbons (ACs) are an outstanding adsorbent and commonly used for adsorption of CO^2. The main purpose of this work was to prepare various ACs from the same precursor at various activation temperatures, investigate both porosity development (surface area, pore volume, micropore volume) and CO^2 adsorption. A commercial AC WG12 (Gryfskand Sp. z o. o. Poland) was chemically activated with K_2CO_3 at temperatures ranging from 600 to 850 °C, with a constant mass ratio WG12:K^2CO_3=1. The micropore volume (and specific surface area) of the resulting ACs varied from 0.42 cm3/g (1128 m^2/g) to 0.48 cm^3/g (1247 m^2/g) depending on the temperature used in the activation process. The AC obtained at temperature of 850°C exhibited the highest specific surface area and micropore volume. The CO_2 adsorption increased with increasing the temperature. The highest adsorption of CO_2 (2.6 mmol g-1) was obtained on the AC prepared at the temperature of 850°C.

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One-pot synthesis of NiO nanorods- like hierarchical microspheres as electrode material for electrochemical performance

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We report the effect of calcination on the structural and optical properties of nanocrystalline NiO nanoparticles. A novel sol-gel technique was used to prepare the NiO nanorods at room temperature (RT). These were successfully synthesized by virtue of a single source precursor method at mild reaction conditions between nickel nitrate and sodium hydroxide. omposition, structure and morphology of the products were analyzed and characterized by X-ray powder diffraction (XRD). The ultra-violet visible (UV-vis) absorption peaks of NiO exhibited a large blue shift and the luminescent spectra had a strong and broad emission band centered at 328 nm. The intense band gap was also observed, with some spectral tuning, to give a range of absorption energies from 2.60 to 3.41 eV. The various functional groups present in the NiO nanorods were identified by FTIR analysis. High resolution transmission electron microscopy (HRTEM) and the chemical composition of the samples the valence states of elements were determined by X-ray photoelectron spectroscopy (XPS) in detail. The electrochemical response of NiO proved that the nano-nickel has a high level of functionality due to its small size and higher electrochemical activity without any modifications. The above studies demonstrate the potential for the utilization of NiO nanoparticles as a promising material for opto-electronics applications.

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